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Current Fire Research Activities: Strengthening Safety through Research



Fire Modeling

The U.S. Nuclear Regulatory Commission (NRC)-Office of Nuclear Regulatory Research (RES) Fire Modeling Program provides methodologies, tools, and support for the use of fire modeling in nuclear power plant applications.

NUREG/CR-6978, "A Phenomena Identification and Ranking Table (PIRT) Exercise for Nuclear Power Plant Fire Modeling Applications," issued November 2008 – A study of current fire modeling capabilities, including identifying additional capabilities needed to improve the NRC's confidence in the results. The PIRT also helped to define future research priorities in the fire modeling area.

NUREG/CR-6931, "Cable Response to Live Fire (CAROLFIRE) Volume 3: Thermally-Induced Electrical Failure (THIEF) Model," issued April 2008 – Documents a simple cable damage model called THIEF (Thermally-Induced Electrical Failure), developed by the National Institute of Standards and Technology (NIST), that uses empirical data about cable failure temperatures to predict the time to cable damage.

NUREG/CR-7010, "Cable Heat Release, Ignition, and Spread In Tray Installations during Fire (CHRISTIFIRE) Volume 1: Horizontal Trays," issued Spring 2011 – Documents a simple model called FLASH-CAT (Flame Spread over Horizontal Cable Trays), developed by NIST, that

predicts heat release rate and flame spread for cables in Horizontal tray configurations.

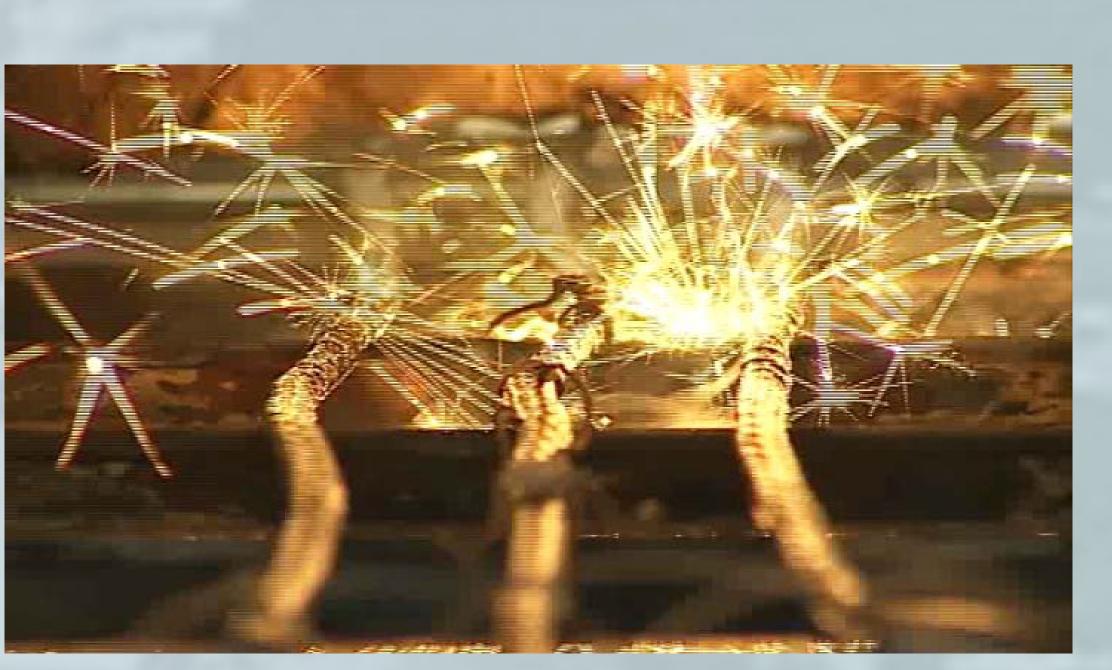
Draft NUREG-1934, "Nuclear Power Plant Fire Modeling Application Guide," issued Spring 2011 – Provides guidance to assist those who perform fire modeling analyses and reviews of nuclear power plant fire scenarios.

NUREG-1805 Supplement 1, "Fire Dynamics Tools (FDTs)," issued March 2011 – Adds the THIEF model to the suite of FDTs spreadsheets and documents corrections and improvements made to the original spreadsheets.

Electrical Systems-Circuit Analysis

Fire-Induced Electrical Failure Phenomena Identification and Ranking Table (PIRT) – Convenes experts from the NRC and industry to systematically rank the importance and state of knowledge of various fire-induced effects on electrical circuit configurations.

Fire Probabilistic Risk Assessment (PRA)
Expert Elicitation – An NRC and industry PRA
expert panel to develop best estimate
probabilities for various fire-induced electrical circuit and cable failure configurations,
along with addressing spurious actuation
duration use in fire PRA.



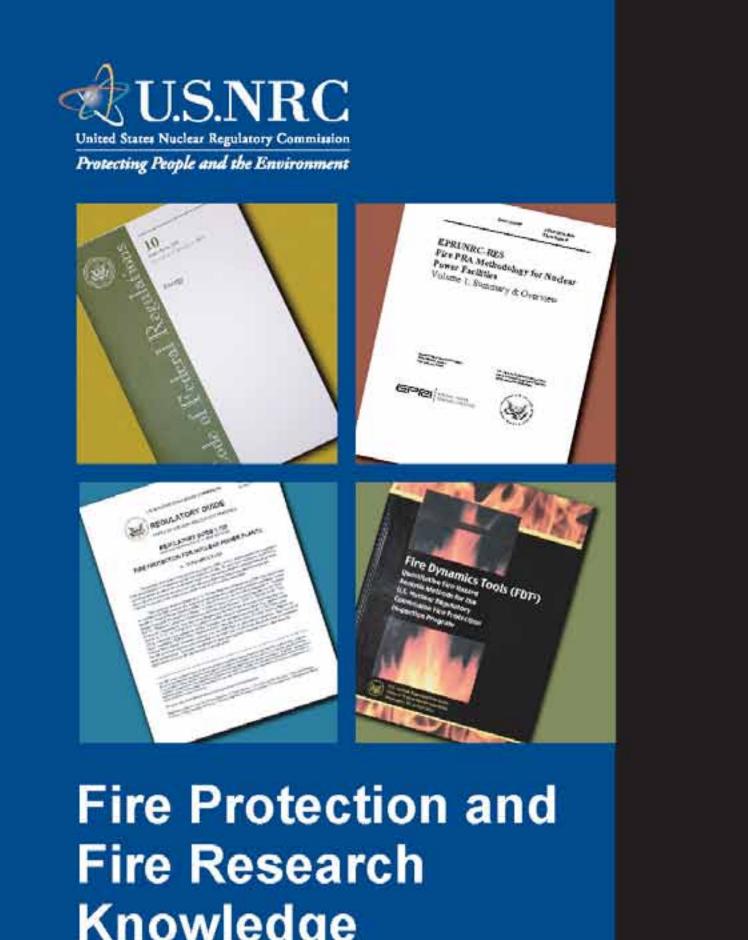
Fire Research Knowledge Management

The Fire Research Knowledge Management Program is intended to support the NRC's knowledge management initiative in the fire protection area by identifying relevant information to be documented.

NUREG/BR-0465, "Fire Protection and Fire Research Knowledge Management Digest," issued February 2010 – User-friendly database that provides information needed during activities such as inspections and reviews.

NUREG/BR-0361, "The Browns Ferry Nuclear Plant Fire of 1975 and the History of NRC Fire Regulations," issued February 2009 – Contains all major public documents pertaining to the Browns Ferry fire to create a well-rounded picture of the event.

NUREG/BR-0364, "A Short History of Fire Safety Research Sponsored by the U.S. Nuclear Regulatory Commission, 1975-2008," issued June 2009 – Provides a history of the NRC's fire safety research activities, divided into four major phases beginning in 1975.



Fire Research Knowledge Management Digest

Office of Nuclear Regulatory Research

Fire PRA & Human Reliability Analysis

NUREG/CR-6850 (EPRI TR-1011989), "EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities," issued September 2005 – Documents state of the art methods, tools and data for the conduct of a fire PRA for a commercial nuclear power plant. RES in conjunction with the Electric Power Research Institute (EPRI), continues to provide training yearly on NUREG/CR-6850 at the NRC-RES/EPRI fire PRA course. EPRI and RES are also working jointly to update and improve the fire events database used for

NUREG/CP-0194, "Methods for Applying Risk Analysis to Fire Scenarios (MARIAFIRES)," issued July 2010 – Documents the video taped sessions and training materials from the 2008 NRC-RES/EPRI Fire PRA Course to enable self-study for persons unable to attend the course. MARIAFIRES-

this NUREG/CR.

ment the 2010 course.

NUREG-1921 (EPRI 1019196), "EPRI/NRC-RES
Fire Human Reliability Analysis Guidelines,"
issued November 2009 – RES and EPRI col-

2010 is currently being developed to docu-

laborated to develop a methodology and associated guidance for performing quantitative human reliability analysis for the post fire mitigative human actions modeled in a fire PRA. A module was added to the NRC-RES/EPRI fire PRA course this past year covering this methodology.

Fuel Cycle Oversight Process Revision – Evaluates the development of risk insights, methods, and tools that could be applied to the oversight of fuel facilities.

Fire Testing

Cable Heat Release Ignition and Spread in Tray Installations during Fire (CHRISTIFIRE) – An effort to quantify the mass and energy released from burning electrical cables. Information from these tests will be used to develop more realistic models of cable fires for use in PRAs.

Direct Current Electrical Shorting in Response to Exposure during Fire (DESIREEFIRE) – Testing intended to help the fire protection community better understand direct current circuit-failure characteristics.

Beyond-Design-Basis Fires for Spent Fuel Transportation: Shipping Cask Seal Performance Testing – Testing to determine the performance of a shipping cask seal in beyond-design-basis fire scenarios and to provide the physical data needed to better understand the likelihood of a radioactive material release.





